WHAT IS CLAIMED IS

1. An injection molding apparatus for a light metal alloy comprising:

a screw extruder located substantially vertically and having an extrusion screw rotationally at the inside of a chamber;

a cooling unit for cooling a light metal material supplied in the chamber so as to be formed into a molten metal or a semi-solidified slurry;

a nozzle connected at a base end thereof to a discharge port of the chamber and having a discharge port formed at a distal end thereof; and

a clamping device for injection molding the molten metal or the semi-solidified slurry discharged from the discharge port of the chamber, in which

the clamping device is adapted to open or close a movable plate relative to a stationary plate in a horizontal direction and, further, a connection member having, at the inside, a first channel substantially in a vertical direction to the moving direction of the movable plate and a second channel extending horizontally from the lower end of the first channel and in communication with the stationary plate is connected with a discharge port at the lower end of the chamber.

2. An injection molding apparatus as defined in claim 1, further comprising:

a hopper for storing the molten metal connected to an upper portion of the chamber.

3. An injection molding apparatus as defined in claim 1, wherein the screw extruder has an injection function of moving the extrusion screw in the axial direction to inject the molten metal or the semi-solidified slurry.

4. An injection molding apparatus as defined in claim 3, wherein a rounded portion is formed to a joined portion between the first channel and the second channel for smoothly turning the direction of the molten metal or the semi-solidified slurry.

5. An injection molding apparatus as defined in claim 1, wherein the

screw extruder has an extrusion screw not moving in the axial direction, and an injection plunger moving in the horizontal direction is disposed in the second channel.

6. An injection molding apparatus as defined in claim 5, wherein a check valve is disposed in the first channel for preventing the semi-solidified slurry in the second channel from flowing backward to the screw extruder.

7. An injection molding apparatus as defined in claim 1, wherein the extrusion screw comprises a central shaft rotatably inserted in the chamber and a plurality of screw segments fitted over the outer circumference of the central shaft and arranged in the axial direction.

8. An injection molding apparatus as defined in claim 7, wherein each of the plurality of the screw segments has a compression ratio of 1.0 and is formed into an identical axial length.

9. An injection molding apparatus as defined in claim 7, wherein the central shaft is made of a metal material of high temperature creep strength and the plurality of the screw segments are made of material excellent in resistance to melting damage to the molten metal or the semi-solidified slurry.

10. An injection molding apparatus as defined in claim 1, further comprising:

a static mixer disposed in the nozzle for mixing the semi-solidified slurry passing through the nozzle.

11. An injection molding apparatus as defined in claim 10, wherein the static mixer comprises a stirring blade formed in a shape twisted around the axial center of the nozzle.

12. An injection molding apparatus as defined in claim 11, wherein the stirring blade comprises a plurality of stirring blades of different twisting directions and these blades are arranged in the axial direction in the nozzle such that these blades are in perpendicular to each other.

13. An injection molding apparatus as defined in claim 10, further comprising:

a heating member disposed at the periphery of the nozzle for setting temperature of the light metal alloy in a portion corresponding to the static mixer to a temperature higher than the liquidus temperature.

14. An injection molding apparatus as defined in claim 10, further comprising:

a heating member disposed upstream to the static mixer, for setting a temperature of the light metal alloy in a portion upstream to the static mixer to a temperature between a solid state and a liquid state.

15. An injection molding apparatus as defined in claim 10, further comprising:

a temperature setting member disposed in a discharge port of the nozzle for forming a solid plug.

16. An injection molding apparatus as defined in claim 10, further comprising:

an on/off valve disposed to a portion downstream to the static mixer for opening or closing the discharge port of the nozzle.

17. An injection molding apparatus as defined in claim 1, wherein a slitwise channel is disposed in the nozzle for causing a shearing flow to the semi-solidified slurry passing through the nozzle.

18. An injection molding apparatus as defined in claim 2, further comprising:

a melting furnace for heating the solid material into a molten metal the melting furnace being located substantially at the identical ground level with that of the clamping device; and

a molten metal supply unit for supplying the molten metal in the melting furnace by way of a supply pipeline shielded with an inert gas to the hopper.

19. An injection molding apparatus as defined in claim 2, further

comprising:

a level sensor for detecting the surface height of the molten metal in the hopper; and

a control device for controlling the amount of the molten metal supplied to the hopper based on the signal from the level sensor such that the surface height of the molten metal is not higher than the position for the shaft seal of the extrusion screw.

20. An injection molding apparatus as defined in claim 18, wherein the melting furnace comprises an induction heating type heating device for instantaneously melting the solid material into a molten metal.

21. An injection molding apparatus as defined in claim 1, wherein the chamber comprises a heating unit for heating the material at the inside.

22. A method of injection molding a light metal alloy comprising the following steps of:

cooling a molten metal under shearing by an extrusion screw and thereby forming the same into a semi-solidified slurry in a chamber of a light metal alloy injection molding apparatus as defined in claim 1;

discharging the semi-solidified slurry from a discharge port at the lower end of the chamber;

turning the direction of the semi-solidified slurry once into a horizontal direction; and then

injecting the semi-solidified slurry into molding plates opening/closing in a horizontal direction.

23. A method of injection molding a light metal alloy comprising the following steps of:

melting a light metal material into a molten metal by a melting furnace located at a ground level;

supplying the molten metal to a hopper in a chamber of an injection molding apparatus as defined in claim 2 located substantially vertically at the ground level;

cooling the molten metal under shearing by an extrusion screw and forming the same into a semi-solidified slurry in the chamber; and

turning the direction of the semi-solidified slurry from a discharge port at the lower end of a chamber into a horizontal direction and then injecting the same into molding plates opening/closing in the horizontal direction located at the ground level.

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24. A method of injection molding a light metal alloy in which a molten metal is cooled under shearing by an extrusion screw into a semi-solidified slurry in a substantially vertical chamber and, subsequently, the semi-solidified slurry discharged from a discharge port at the lower end of the chamber is once turned in the horizontal direction and then injected into molding plates opening or closing in the horizontal direction.

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